

Associations between Language Disorders and Symptoms of Socio-Emotional Behavioural Problems in Three-Year-Old Children

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Abstract

Children with communication-disorders are “at risk” of additional problems in social, emotional and behavioural development. Speech and language are intimately involved with other areas of development. Thus it might be expected that children with a significant handicap in this area of development would be handicapped in other areas of development as well. Research is needed to further explore the nature of the relationship.

It was proposed that children with language disorders would have disproportionately high rates of socio-emotional behavioural difficulties. The sample was from the Autism Birth Cohort-study (ABC-study), a sub-study of the Norwegian Mother and Child Cohort (MoBa).

Participants were recruited into the MoBa study. Parents completed questionnaires that screened for social and communication disorders at 36 months. Children who screened positive were invited for a full clinical assessment. In addition a control group of randomly drawn children from all participants in MoBa were invited for assessment. This study includes 35 children diagnosed with a language disorder as well as 25 children from the control group (mean age 42 months). Analysis of children’s language in a mother-child play situation was conducted. Measures of intelligibility (INT) and mean length of utterance (MLU) were compared to socio-emotional behaviour as measured by the Preschool Age Psychiatric Assessment (PAPA).

An weak association between language disorders and socio-emotional difficulties was found. Exploring the relationship further results showed that a receptive-expressive language disorder in combination with low intelligibility were a risk-marker of externalising behaviour problems. Children with three or more symptoms of externalising behaviours in addition to low intelligibility were at risk of internalising behaviour problems.

Introduction

Children with language disorders are known to have more extensive psychiatric and developmental problems than children with normal language development (Baker & Cantwell, 1982; McCabe, 2005; Redmond & Rice, 1998). The comorbidity prevalence of language disorders is 50% for any other diagnosis (Toppelberg & Shapiro, 2000). Researchers have demonstrated that early communication failure can lead a child into a negative social spiral (Brinton & Fujiki, 1993). Children with language disorders are less likely to be chosen as playmates, because of their limited communicative ability. Rejection by peers leads to lack of exposure to language building opportunities. Consequently, this leads to a further deficiency of communication exchanges, lack of practice and feedback, and reduced social growth opportunities.

How difficulties interrelate is of importance to the assessment and intervention process, which ensures treatment strategies and recommendations are appropriate (Redmond & Rice, 1998). Language disorders in pre-school-age are more frequent than in school-age children, but are often, at pre-school age, better characterised as a risk factor than disorders. Most children with language disorders recover to the normal range of language development by five years of age (Whithurst & Fischel, 1994). For those who do not recover, however, language disorder in early childhood is one of the best predictors of future and concurrent psychopathology (Silva, Williams, & McGee, 1987). Further, epidemiological data has shown that the co-occurrence of two or more child psychiatric conditions far exceeds that expected by chance (Caron & Rutter, 1991). Attention should therefore be paid to markers of comorbidity of language and psychopathology in pre-school children.

It has been suggested that certain subtypes of language disorders are related to specific symptoms of psychopathology such as socio-emotional and behavioural difficulties. It is common to distinguish, at least, between difficulties in comprehension and expression of language. Bishop and Edmundson (1987) argued that language disorders involving comprehension difficulties have higher rates of socio-emotional comorbidity than do expressive difficulties alone. Beitchman et al. (1996) suggested that children with both comprehension and expressive disorders were at highest risk, in association with a number of other risk factors, such as unmarried parents, low socio-economic status, impaired hearing, visual-motor deficits, and behavioural problems. These findings are similar to findings in

earlier studies, like those by Baker and Cantwell (1982) and Silva, Williams, and McGee (1987).

In a review of the language comorbidity literature, Toppelberg and Shapiro, (2000) found that the prevalence of language deficits in children who exhibit antisocial behaviours was 10 times that of what is found in the general population. Also, aggressive children generally use less verbal communication and more direct physical action to solve interpersonal problems. These findings indicate that the same association is found if you study a group with behaviourally disrupted children as if you study children with language disorders. If communication fails, a young child with language disorders will probably use immediate means to meet needs, whereas an older child will be more likely to feel inadequate, and develop poor self-confidence. Psychopathological symptoms are more prevalent in older children with language disorder (Cantwell & Baker, 1987; McCabe, 2005; Redmond & Rice, 2002). Differences in research conducted on the association between language and socio-emotional behaviour indicate that language-disordered children are a heterogeneous group, and it is therefore important to study the different subgroups separately.

Terminology

Language as a research field is in general wide and comprehensive. The several different labels used to describe children with language difficulties indicate the diversity in the understanding of children with language disorders. A broad differentiation can be made between delayed and deviant language (Toppelberg & Shapiro, 2000). Delayed language resembles the pattern seen in younger children, with typical language development. Delayed language is, for example, seen in children who are intellectually disabled. Deviant language is described as patterns of uneven abilities that are not seen in normally developing children. Deviant language development is common in children with pervasive developmental disorder (PDD). Both differentiations are found in literature describing language disorders.

In earlier research on language disorders, a differentiation was usually made between speech, understood as verbal communication of meaning, and language, seen as a socially shared code to communicate meaning (Baker & Cantwell, 1982). This division is arguably too simplistic because many children have deficits in both categories, and each category includes a range of differing impairments in terms of causal factors and symptomatology (Broomfield & Dodd, 2004). In recent research, language disorders have been referred to using such terms as Specific Language Impairment (SLI) and Developmental Language Disorder (DLD). SLI is

generally defined as a developmental disorder of language in the absence of neurological damage, hearing deficits, severe environmental deprivation, or mental retardation (Ullman & Pierpoint, 2005). The usage of the term SLI has been widely discussed by researchers because the term “specific” suggests that the language disorder is distinct and within a single domain of development (Bishop, 2002). Because of the frequent comorbidity with this disorder, and because causal factors are weak, some researchers stay clear of the term, unless they are actually referring to a disorder that is a pure and specific language impairment. Bishop (2002) suggests that the term “specific developmental language disorder” is appropriate when children are delayed in language but other skills and areas of functioning are within normal range. The inclusion of the word «developmental» indicates that language is delayed but not otherwise abnormal, such as in the case of children with pervasive developmental disorder (PDD).

It is important to be aware that researchers have not always been particular in the use of these definitions. It is sometimes difficult to know, whether research to date has actually measured language and not other developmental difficulties such as autism or mental retardation. Since delayed language development and poor comprehension are typical features seen in children with autism (Bishop, 2002), some studies, especially if done on young children and with questionnaires, might not have been able to make the distinction between an autistic disorder and a disorder of language. Because of the lack of control of such issues, and because of the differentiated use of labels and grouping in the language and comorbidity literature, it is difficult to summarise findings in this research field. Since literature is not consistent in use of any of the mentioned definitions, it was decided to use the term language disorder (LD) in the present study.

In addition to differentiated concept usage, there are also other reasons why the research field on language comorbidity is not perspicuous. The major controversies in the comorbidity literature, especially concerning language and socio-emotional behavioural difficulties, are presented in the following section.

Controversies in research on comorbidity with language disorders

As with terminology used to describe language disorders, terms such as socio-emotional problems can be ambiguous and difficult to understand. Socio-emotional behaviours are often divided into externalising and internalising difficulties (Achenbach, Edelbrock, & Howell, 1987). The term internalising is used to describe behaviours that do not directly affect others.

In preschool children emotional problems such as, anxiety, depression and phobias is often seen as symptoms of future internalising behaviour (Mesman, Bongers, & Koot, 2001). The term also covers the outcomes of these problems, such as socially withdrawn behaviour, lack of friendship, and poor social initiation (Conti-Ramsden & Botting, 2004). Externalising behaviours are often understood as overt and visible behaviours directed outwards, and include different forms of aggression, and rule breaking (Brunnekreef et al., 2006). They are also often associated with delinquency, anti-social behaviour, and conduct disorder (Dionne, Tremblay, Boivin, Laplante, & Périusse, 2003; Redmond & Rice, 1998). Externalising and internalising behaviours predict different trajectories. Whereas both are thought to be consistent over time, pre-school internalising behaviour, is thought to be a protector of future externalising behaviour. Preschool externalising behaviour, on the other hand are thought to play a significant role in the pathway to future internalising behaviour (Mesman, Bongers, & Koot, 2001).

Some researchers do not exclude attention deficit hyperactivity disorder (ADHD) from externalising behaviours (Irwin, Carter & Briggs-Gowan, 2002), whereas others treat ADHD as separate from other externalising behaviours (Brunnekreef et al., 2007). Different forms of socio-emotional behaviours are typically associated with different age groups, and are also known to change over time. In the current study, ADHD symptoms were excluded from measures of externalising behaviours, to provide a more specific definition of symptomatology.

Continuity vs. Discontinuity of disorders.

Classification of childhood psychiatric disorders, including language disorders, gives rise to several questions. The pre-school period involves rapid changes in physical (including neural), behavioural, emotional and cognitive development. This makes it difficult to identify valid symptoms or clusters of symptoms that can be reliably measured (Egger & Angold, 2006). It has been suggested that children under the age of five, with slow or deviant language development, scoring under the 25th percentile, meaning that they fall in the bottom quarter of the normal distribution, on a standardised language test are potentially at risk for language disorders (Coni-Ramsden & Hesketh, 2003). The problem with this suggestion is that there are few good language tests for pre-school children. Language ability changes rapid in the pre-school years and are under constant development. Not all children go through the same changes at the same times, and to find a measure that capture language development at this

certain time is difficult. The text revision of the fourth edition of the diagnostic statistic manual (DSM-IV; American Psychiatric Association (APA), 2000) opens up for the possibility of diagnosing language disorders in children without a language test. An experienced clinician can base a diagnosis on a thorough assessment of the child in question, if a language test is not available.

Language disorders are thought to increase the risk of behavioural difficulties. Brownlie and colleagues (2004) found that children with speech and language disorders in pre-school were at greater risk of antisocial behaviours, but that this effect was not seen until the child was older. Children aged 3 to 6 years with LD show fewer behavioural problems than older children do. In follow-up studies, however, preschool children with language developmental disorders had increased rates of behavioural problems when reassessed later in childhood (Willinger et al., 2003). The behavioural problems might be present at an earlier age, but they are not yet severe enough to be in the clinical level. Externalising behaviours are often seen at an earlier age than internalising behaviours (Cantwell & Baker, 1987; McCabe, 2005). Although, in a study by Irwin (2002) children with disorders in expressive language, and a mean age of two years and three months, were found to have higher rates of internalising than externalising behaviour. Other researchers also argue that it is possible to detect very early onset of certain comorbid phenotypes. Dionne and colleagues (2003) found that at 18- 24 months of age expressive vocabulary predicted later registered criminality. Studies by Stattin and Klackenborg-Larson (1993) suggested that language performance during infancy and preschool years could play an important role in the development of antisocial trajectories later in life. Therefore, awareness of markers associated with language disorders as early as possible is important.

Teacher vs. Parent reports of language and behaviour

Parents and teachers often report symptoms of childhood disorders differently. It is often seen that parents are more likely to report internalising difficulties than teachers are (Hinshaw, Han, Erhardt & Huber, 1993). However, teachers report significantly higher levels of withdrawal in language impaired children than in normally developing children (Hart et al., 2004). When a child has more overt problems, such as externalising behaviours or language disorders, the problems are more visible and easier to detect. Also, compared to self-reports, teachers report fewer internalising difficulties. Only 16% of the children in Conti-Ramsden and Botting's (2004) sample were thought to have emotional difficulties, as reported by

teachers. In contrast 30% of the children gave themselves scores on this scale. In contrast, teachers report more externalising behaviours in pre-school children than do parents (Hinshaw et al., 1993). Irwin and colleagues (2002) found that children (mean age 26 months) with expressive language difficulties were rated by their mothers as having poorer social-emotional adjustment than normally developing peers. However, they were not rated as having more externalising behaviours than peers. It is important to be aware of the different patterns of cross-informant convergence across internalising versus externalising domains, but contradictories in findings such as seen in these studies reveal the complexity of research on comorbidity. Yet another consideration to be aware of is the difference in how children with language disorders are recruited into research projects.

Population based vs. clinical studies

When using community samples, in order to study language disorders, researchers have more power in selecting an empirical category system with categories that minimise within-group differences, and produce non-overlapping groups of children (Beitchman, 1996). When others decide the categories, like they do when participants are recruited from clinical samples, children will be put into predetermined categories, that the researcher can not control. In clinical samples the children are often more severely impaired than children in population based samples. In a population based sample the entire spectrum of a feature is represented whereas only the most obviously impaired are represented in the clinic. This is why weaker associations between language impairment and socio-emotional behaviours have been found when research is done on population sample. For example, in a community study by Tomblin, Zhang, and Buckwalter (2000), 8 year-old language impaired children had only moderate levels of behaviour problems. Furthermore, in another community sample of 4000 pairs of twins, Plomin, Pirce, Eley, Dale, and Stevenson (2002) found only moderate associations between behavioural problems and verbal development. On the other hand, in a clinic, children in the borderline of being diagnosed with a language disorder, might have other problems that makes the language impairment invisible to the clinician. This makes it difficult to generalise findings from a clinically based study to a larger population.

Sub-diagnoses of language in relation to socio-emotional behaviour

As mentioned, different types of socio-emotional behaviours have been associated with different subgroups of LD. DSM-IV (APA, 1994) operates with three different sub-diagnoses

of language disorders. These are phonological, expressive, and mixed receptive-expressive language disorder. Labels different from these are often used throughout the literature. However, most research distinguishes between expressive and receptive language disorders. Expressive language is often associated with both phonological and expressive LD, whereas receptive relates to mixed receptive-expressive LD, as used in DSM-IV. Different behavioural outcomes are associated with the different sub-diagnoses, and receptive-expressive language disorder is often ranked as the most severe disorder since affected children are more at risk of emotional and behavioural difficulties (Toppelberg, 2000). Receptive language disorders are a high-risk indicator of more pragmatic, psychiatric comorbidity, of poor social competence, and of hyperactivity, and they are often not suspected or detected before children start school (Toppelberg, 2000).

Outcome studies suggest that children with language disorders are at risk for psychiatric outcomes in their future, especially if the language disorder does not resolve before the child starts school. Children with more severe language disorders consistent into school years, delayed in both expression and reception of language, are more at risk of later psychosocial difficulties than other children are. Prognosis seems to be worst for those with low non-verbal IQ. An argument is that LD in itself is not a risk factor, severity, type and persistence however is (Snowling, Bishop, Stothard, Chipchase, & Caplan, 2006).

Results from Beitchman and colleagues (1996) indicate that type of language disorder at five years of age is significantly correlated to later behavioural problems. Children with receptive difficulties were at highest risk for both externalising (as reported by teachers) and internalising behaviour (as reported by mothers). Controversely, poor articulation showed few associations with any behavioural problems (Beitchman, 1996). This is also one of the main findings in a literature review by Benner, Nelson and Epstein (2002); children with receptive-expressive language deficit had higher rates of behaviour problems than did children with specific expressive language impairments. However, findings concerning subdiagnoses and type of outcome are inconsistent in the literature. Some report that the most frequent behavioural problems seen in children with mixed language disorder is withdrawn behaviour, whereas children with expressive difficulties show more aggressive behaviour (Willinger et al., 2003). Others found that receptive language disorders were more severely linked to externalising behaviour problems, whereas expressive language disorders are more frequently linked to internalising behavioural problems (Redmond & Rice, 1998).

A possible explanation for these different findings is that it might sometimes be difficult to separate problems like psychosocial and emotional problems from problems with language and communication (Cohen, 2005). Especially during the first three years of life language disorder and socio-emotional behaviour difficulties are known to overlap and it is likely that the disorders influence each other.

As seen, having a language disorder that involves both receptive and expressive language is considered worse than having a disorder where only expressive language is delayed. In the same way it is considered worse to have symptoms in both internalising and externalising behaviour. Children who possess a comorbid behaviour pattern, involving both internalising and externalising behaviours, are more likely to display a greater range of atypical social behaviours than are children who demonstrate only one type of problem behaviour. For example, children who sometimes display aggressive and sometimes withdrawn behaviour might be viewed by others as inconsistent and unpredictable. This may affect formation and maintenance of social relationships (Ladd & Burgess, 1999). Some children, who display both externalising and internalising behaviours, also have an additional language disorder. However it has not been done much, if any, research on the comorbidity between externalising/internalising behaviours and language disorder in young children. Comorbidity between language disorder and aggressive/inhibited behaviour would indicate a more severe condition, than comorbidity between language and each type of behaviour separately.

In the current study, the association between language disorders and symptoms of socio-emotional behavioural problems in three-year-old children is explored.

The current study

The current study is based on the ongoing Autism Birth Cohort study (ABC-study). Language and communication abilities are a central part of research on autism. The ABC-study aims to find biological and developmental causes of autism spectrum disorders. Participants are children from a population-based screening of 40,000, 3 ½ years old children. The screening, based on questionnaires completed by mothers, consisted regarding, amongst others, questions of language and communication development. The screening process incorporated a large group of children characterized with language difficulties attending the ABC assessment, as potential autism spectrum disordered children.

After careful assessments, the children not suspected or diagnosed with an autism spectrum disorder, but with significant impairment in language, were included in the current study. The intention was to further explore the profile of these children. Children were investigated with consideration to the nature of co-occurring socio-emotional behaviour problems. The sample consisted of 35 LD preschool children, and 25 randomly drawn, age matched non-impaired peers. While earlier research has been focused mostly on subgroups based on diagnoses, in addition to the differentiation between diagnoses the current study took into consideration continuous measures of language. From video analysing and transcribing the children language was differentiated by measures of mean length of utterance and degree of unintelligibility. They were also compared on number of complete verbal utterances per 10 minutes.

There were two main research questions in the current study:

- 1) Does children with language disorders differ from a control group on parent-reported symptoms of socio-emotional behavioural problems?
- 2) Which of the different language diagnoses, and language measures differentiate the association between LD and socio-emotional behaviour problems further?

Method

Participants

Children were recruited from a pregnancy cohort into the longitudinal Norwegian Mother and Child Study (MoBa; Magnus et al. 2006)). Parents completed mailed questionnaires that screened for social and communication disorders when children were 36 months of age. The 36-month questionnaire includes Social Communication Questionnaire (SCQ) items corresponding to DSM-IV diagnostic criteria. Children born on or after February 1st 2002, who screened positive on one of the criteria in the questionnaire, were invited for a full clinical assessment in the Autism Birth Cohort Study (ABC). The screening criteria for participation in the ABC study, were a) SCQ score ≥ 12 , b) Receptive behaviour sub-domain on SCQ = 9, c) Parent reports language delay and child has been referred to a specialist, d) parent reports autism/autistic trait or reports that child has been referred to a specialist, e) parent reports worry that child shows very little interest in playing with other children.

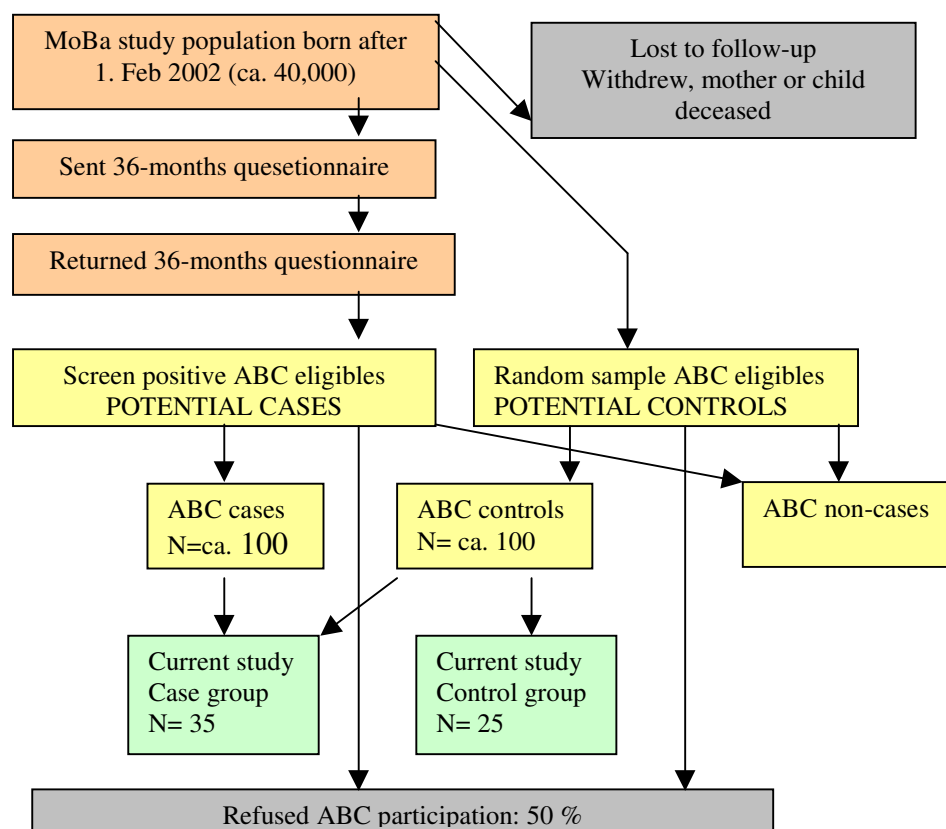
The screening resulted in a large group of children with language and communication difficulties, not displaying any symptoms of autism spectrum disorders. Children with an assigned or a suspected diagnosis of language disorder after the clinical assessments composed the target group in the current study. These were 35 children with a mean age of 42 months.

In addition to screened children, a control group was randomly drawn from all participants in MoBa for clinical assessment in the ABC-study. Twenty-five children were randomly drawn from the ABC control group (mean age 42 months), and included as a control group in the current study.

All children included in the current study were participants in the ABC study between the beginning of the clinical assessments, in December 2005 and February 2007. Table 1 presents a flow chart, describing the path of participants from MoBa to the current study (S. Schjølberg, personal communication, April, 2007). All participants were Norwegian citizens, born in Norway, and none were bilingual. One was a dizygotic twin.

Table 1.

Flow chart of path of participants in the MoBa-study, ABC-study, and present study



Procedures

Clinical Assessments.

During a two days assessment at the ABC clinic, the following assessment methods were used; Stanford Binet 5th edition (SB5; Roid, 2003; Norwegian translation by the National Institute of Public Health, with authorisation from the authors), Mullen Scales of Early Learning (Mullen, 1995), and Autistic Diagnostic Observation Scale (ADOS; Lord, Rutter, & Di Lavore, 2002). Mothers of participants were also interviewed with; Preschool Age Psychiatric Assessment (PAPA; Egger, Asher & Angold, 1999; Norwegian translation by the National Institute of Public Health, with authorisation from the authors), Vineland Adaptive Behavior Scales (VABS; Sparrow, Balla, & Ciccehetti, 1998; Norwegian translation by the National Institute of Public Health, with authorisation from the authors), and Autistic Diagnostic Interview - revised (ADI-R; LeCouteur, Lord & Rutter, 2000). While at the ABC clinic children also underwent a medical assessment, a conversation with a diagnostician, and was observed during play with their mothers.

Diagnoses.

Based on information from all testing, observations, and interviews a staff meeting was held between the clinicians involved in the assessment of each child. An experienced diagnostician decided together with the staff, whether the child should be diagnosed or not. Diagnoses according to the DSM-IV were used (APA, 2000). Since no language test was available, all information from the two days assessment was used as a foundation for diagnosing children with language disorders. Nine children received a diagnosis of mixed expressive/receptive language disorder, whereas 8 were diagnosed with expressive language disorder, 2 with phonological disorder, and 5 with diagnoses of both phonological and expressive disorders. In the current study children with expressive and phonological difficulties were grouped together. Some children also were suspected of a LD diagnosis, but did not fill the criteria for a full diagnosis. Both children with assigned and children with suspected diagnosis of language disorder were significantly different from the group of normally developing children (see result section for further information). The children with a suspected diagnosis of language disorder were therefore included in the LD group in the initial part of the analyses of the current study.

Of the LD children included in the current study 18 were screened in to the ABC study based on parent reports of language delay and referral to a specialist. Eight were screened in

on problems not related to language and 9 of the children were screened in as controls. All children included in the current study were controlled for comorbid diagnoses of mental retardation, autism and other neurodevelopmental disorders, which are exclusion criteria in the DSM-IV for a diagnosis of language disorders.

A comparison was made between LD children and children in the control group concerning mother and father's education based on mother's reports in a questionnaire at 15th week of pregnancy, and no significant difference was found. In the control group one child was diagnosed with disorder in childhood NOS, one was diagnosed with disruptive behaviour NOS, and one with a diagnosis of ADHD. Three were suspected of other diagnoses. Three children with LD had comorbid diagnoses of ADHD. Seven of the children in the LD group were suspected for other diagnoses. Further information on the children can be found in Table II.

Additional Language Measures.

To differentiate the children's language disorders beyond diagnoses, a video analysis was done, and transcriptions were made of the children's language. The chosen observation situation was a 10-minute sequence where child and mother played together. The mothers were alone with the child in a test room, and played with a pre-decided toy for five minutes. The tester then asked the mother to change to another pre-decided toy for the next five minutes. This was considered to be the time during the two-day assessments that the children produce most language, and was also considered to be the most natural setting.

Language samples were collected, and analysed using the Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2004). This is a computer program designed to analyse expressive language. Three parameters were chosen to describe detailed functions of language: a) mean length of utterance (MLU); b) percent intelligible utterances (INT), and; c) complete verbal utterances (CVU). MLU and INT were used as language measures, and scoring low on these measures was associated with poor language skills. Due to the age, and lack of developed linguistic complexity of the participants, comprehensive grammatical measures were not included.

The transcriptions were done by three master students in psychology (author included). Interrater reliability was tested using interclass correlation (ICC). Twenty percent randomly drawn language transcripts were re-transcribed by one of the other raters. The

interrater reliability of the two language measures was .85 on ratings of INT, and .87 on ratings of MLU.

Measures of Socio-Emotional Behavioural Problems.

Socio-emotional behavioural problems were measured with the parent based clinical interview PAPA (Egger, et al., 1999). This interview was chosen because it is suitable for assessing young children on a broad variety of psychiatric disorders, and it is up to date. The interview is divided into subsections, and items to measure socio-emotional behavioural problems were chosen from the sections of play/peers, depression, behavioural problems, worries, separation anxiety, and anxiety. The variables were grouped into scales of internalising and externalising problems. Items included in the externalising scale were; fights, pushes, pinches, hits, kicks, bites, attacks with object, is evil, bullies, is cruel. The externalising scale represents socio-emotional behavioural problems directed outwards, and is focused around issues of physical aggression. The internalising scale included the following items: prefer to play alone, inhibited behaviour, down-tuned, social anxiety, worries, avoids being alone, and selective mutism. The internalising scale represents socio-emotional behavioural problems directed inwards, with a focus on anxiety and withdrawal. Information of externalising behaviours was missing in four children, whereas information on one child was missing on internalising behaviours.

Measures of non-verbal IQ.

Scores from the SB5 test were used for evaluating the intelligence of children in the present study. The total IQ (TOTIQ) score was included in the initial analyses, but to be able to compare the children with language disorders with the control group, the sub-scale of non-verbal IQ (NVIQ) was used in all other analyses. Two children in the LD group were not tested on SB5, and thus, IQ scores were missing on these children. T-tests were conducted and differences between groups on IQ measures are presented in Table 2.

Measures of socio-economic status.

Information of socio-economic status was gathered from the questionnaires used in MoBa. T-tests were conducted and no statistical differences were found between neither income nor education in LD and control group, as presented in Table 2. All together eleven questionnaires had missing data on at least one of the SES variables.

Table 2.

Sample characteristics

	All	LD	NLD	Difference	sig.
	M (SD)	M (SD)	M (SD)	t	p
Age, months	42 (1,54)	42 (1,59)	42 (1,49)	-,68	,501
NVIQ	100,5 (13,3)	95,6 (20,2)	106,9 (12,3)	-3,10	,001
TOTIQ	94,9 (15,3)	86,9 (11,9)	105,2 (12,8)	-5,55	,000
Edu mother ^a	4,5 (1,2)	4,5 (1,2)	4,5 (1,2)	,03	,976
Edu father ^a	3,9 (1,5)	4,1 (1,3)	3,8 (1,7)	,77	,606
Inc mother ^b	3,6 (1,1)	3,7 (1,0)	3,5 (1,1)	,55	,079
Inc father ^b	4,6 (1,5)	4,6 (1,5)	4,6 (1,5)	,00	,590

Notes: ^a Education: 1) 9-years elementary school, 2) 1-2 years of high school, 3) college (occupational), 4) 3 years junior college, 5) college =< 4 years, 6) university > 4 years.

^b Income: 1) no income, 2) below 150.000 NOK, 3) 150-199.999 NOK, 4) 200-299.999 NOK, 5) 300-399.999 NOK, 6) 400-499.999 NOK, 7) above 500.000 NOK.

Analysis

All statistical calculations were done in SPSS version 14.0. Because the sample was small and assumptions of normality was violated, non-parametric tests were considered, and was conducted together with the parametric tests where this was possible. The difference in the scores however, was small, and it was therefore chosen to present only the results of the parametric tests. When analyses were done with variables where information was missing, these were excluded pair-wise. Statistical techniques used was pearson product moment correlation, independent samples t-tests, one-way analysis of variance (ANOVA), and two-way between groups ANOVA.

Results

This study was concerned with the association between language disorders (LD) and socio-emotional behaviour difficulties. Children with LD were divided into subgroups according to type of LD, and all included children were measured on continuous measures of expressive language. The current study explored the relationship between variables of language and

socio-emotional behaviours, and investigated which language measures best described the association with socio-emotional behaviours at three years of age. Presentation of results will be in four parts. First, a presentation of correlation of language and socio-emotional behaviour variables within the sample is presented and interpreted. Second; group differences between the LD and the group of normally developing children is described, third; differences between subgroups of LD are described, and last interactions among variables was explored.

Correlations between Measures of Language and Socio-Emotional Behaviours

The relationship between the included variables was investigated using Pearson product-moment correlation coefficient (see Table 3.). In addition to the language measures and symptom scales of socio-emotional behaviours, measures of complete verbal utterances (CVU), TOTIQ and NVIQ were included in the correlation equation.

Results showed high correlation with intelligibility (INT) on both outcome measures. Mean length of utterance (MLU) did not correlate significantly with neither externalising nor internalising behaviours. The language measures MLU and INT were highly correlated with each other, with high MLU associated with high INT. Although MLU was not significantly correlated with the outcome measures, it was included in the further exploration because of the high correlation with INT. CVU was not correlated with any of the other variables and was not further investigated, as it seemed like how much children speak, as measured by CVU, was not related to neither internalising nor externalising behaviours in the current study.

When exploring the correlation with IQ scores, it was found that TOTIQ was correlated with MLU and INT, as well as both outcome measures. Since TOTIQ are known to be highly influenced by language the correlation with language measures was expected. NVIQ on the other hand is used throughout literature as a substitute for TOTIQ when language is involved. There was also a high correlation between TOTIQ and NVIQ in the current study. It was expected that the discrepancy between the two IQ measures would be larger, and therefore contribute to a lower correlation coefficient between NVIQ and the language measures. The high correlation could be an indication that NVIQ is more influenced of language than expected, or children with language disorders could in fact be less intelligent. Interpretations of NVIQ should be interpreted with care. It was, however, decided to keep NVIQ in the following analyses. Even though the strength of the relationship with the IQ measures were high, NVIQ was assumed to be the most precise measure of IQ, and is also

the measure most often seen in language related research. TOTIQ on the other hand will be excluded from the analyses to follow. Internalising behaviour was correlated with NVIQ, but externalising was not. The two outcome measures were also correlated with each other.

Table 3.

Pearson Product-Moment Correlation of measures of language, NVIQ and Socio-Emotional Behaviour

Subscale	1	2	3	4	5	6	7
(1) Internalising sympt.	-						
(2) Externalising sympt.	,33*	-					
(3) MLU	-,22	-,21	-				
(4) INT	-,29*	-,36**	,62**	-			
(5) CVU	-,03	-,19	,05	.08	-		
(6) TOTIQ	-,34*	-,22	,60**	,48*	,18	-	
(7) NVIQ	-,30*	-,12	,39**	,35**	,13	,89**	-

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

In the current study a child's percent of intelligible language seemed to be the overall best language measure to describe the association between language disorders and socio-emotional behaviours.

Comparison between LD and control group

As seen in Table 1, the LD and control group did not differ significantly in neither parents' education nor income. It was found that NVIQ was correlated with the language measures, and as expected, there was a significant difference between NVIQ in LD and normally developing children in this sample. In spite of the difference both groups are within what is ranged as normal. Children in both case and control group had a mean age of 42 months. The range in the entire sample was from 39 to 46 months. More boys than girls had LD. The control group consisted of 12 randomly drawn boys and 13 randomly drawn girls. The LD group consisted of 28 boys and 7 girls.

Language measures.

Children with language disorders were expected to score below the non-disordered children on the included measures of expressive language. Independent sample t-tests were conducted to compare scores for case and control group. There was a significant difference in mean length of utterance (MLU) for case ($M=1.8$, $SD=0.44$) and control [$M=2.91$, $SD=0.66$; $t(60)=-7.7$, $p=.00$]. The magnitude of the difference was a large effect (Cohen, 1988) (eta squared=.52). There was also a significant difference in intelligibility (INT) for case ($M=76.62$, $SD=10.79$) and control [$M=94.56$, $SD=4.93$; $t(60)= -8.83$, $p=.000$]. The magnitude of this difference was also a large effect (eta squared=.57). As both MLU and INT were significantly different in case and control group, this indicated a validation of the initial assessments, as a differentiation between the children with a diagnosis of language disorder and the control group of normally developing children on measures of expressive language.

Behaviour measures.

An independent samples t-test was conducted to compare the level of socio-emotional behavioural problems between the groups (see table 4). The sum of socio-emotional behavioural problems was different in case and control group. The magnitude of the difference was a moderate effect (Cohen, 1988). The difference between externalising behaviours in language impaired and normally developing children in this sample was not significant, but a tendency can be seen when inspecting the mean scores, and standard deviations in the groups, towards language impaired children displaying more externalising difficulties. No significant difference between case and control group, concerning internalising behaviours was found. The first research question in the current study was whether children with language disorders would show more symptoms of internalising and externalising behaviour than controls. The behaviour scales separately was not different in LD and control group, but the total score of the summed symptoms supported the hypothesis. The difference was a moderate effect (eta squared = .07; Cohen, 1988).

Table 3.

Differences between groups in mean scores on socio-emotional behaviour scales

	<u>LD</u>	<u>NLD</u>	<u>Difference</u>	<u>sig.value</u>
	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>	<i>p</i>
Ext sympt	1.77 (2.1)	0.92 (1.19)	1.93	0.059
Int sympt	1.24 (1.26)	0.84 (0.99)	1.30	0.198
Sum sympt	3.06 (2.77)	1.76 (1.74)	2.05	0.045

Comparison between Sub-Diagnoses of LD

Language measures.

When analysing the data further, the language-disordered children were divided into three groups according to type of diagnosis set in the ABC clinic. The first group included the children with a suspected LD, the second group consisted of children with expressive and phonological diagnoses, and the third group was children with receptive-expressive LD. The control group was kept as it was. These groups were kept throughout the reminding analyses. A one-way between-groups ANOVA was conducted to explore whether the language measures, MLU and INT as measured by SALT-transcripts, were different between sub-diagnoses of language disorders.

As seen in table 4, there was a statistical significant difference in measures of expressive language for the three diagnosis groups. Post-hoc comparisons using the Tukey HSD test indicated that the mean scores for the control group were significantly different from all the three LD groups on both language measures. The LD groups did not differ significantly from each other, although when inspecting the mean scores, it can be seen that the scores in the suspected group were somewhat higher than in the two other language groups. The same tendencies were seen in both MLU and INT. These results showed that in the current study, the children with language disorders were not further differentiated when comparing diagnosis groups on measures of expressive language.

Table 4.

Means and standard deviations of language measures in sub-groups

	<u>Means (Standard Deviations)</u>			
	Control	Suspected	Expressive	Receptive-expressive
MLU	2,91 (0,66)	2,11 (0,58)	1,63 (0,32)	1,80 (0,28)
INT	94,56 (4,93)	81,10 (6,90)	72,73 (10,03)	76,70 (13,73)

Behavioural measures.

Another one-way between-groups analysis of variance was conducted to explore the difference in symptom scales of internalising and externalising behaviour problems on sub-diagnoses of LD. Because assumptions of homogeneity of variance were violated, robust tests of equality of means was used (Brown-Forsythe and Welch). None of these tests indicated a significant difference between groups. Despite not reaching significance, a difference in mean scores was present. When inspecting the mean scores (see Table V) it was seen that the receptive-expressive group had highest mean scores in both internalising and externalising behaviours. It seemed like, however, that the variance within the groups was higher than the variance between groups. This was explored with further analyses.

Table 5.

Means and standard deviations in symptoms of socio-emotional behaviours

	<u>Means (Standard Deviations)</u>			
	Control	Suspected	Expressive	Receptive-expressive
Ext	0,92 (1,19)	1,33 (1,41)	1,43 (1,79)	2,88 (2,90)
Int	0,84 (0,99)	0,70 (1,01)	1,33 (1,23)	1,67 (1,41)
Sum	1,76 (1,74)	2,11 (1,69)	2,79 (2,36)	4,63 (3,88)

Interaction in the association between language and externalising behaviour

It was found (see table 5) that children with receptive-expressive language disorder had highest mean scores of symptoms of externalising behaviours, although the difference

between groups did not reach significance. Because assumptions of homogeneity of variance were violated, it was assumed that the variance within groups was higher than the variance between groups. When turning back to the correlation table (Table 2), we see that a significant correlation between INT and externalising behaviour, with low INT associated with more externalising symptoms was present. Based on these findings further investigations were done to explore whether an interaction between intelligibility and a diagnosis of receptive-expressive LD would be associated with externalising behaviours. A two-way between-group analysis of variance was conducted. The impact of level of intelligibility and sub-group of language diagnosis on the levels of externalising difficulties was investigated. Participants were divided into groups according to intelligibility level (Group 1: 25 % lowest scores, Group 2: 75 % highest scores). A statistically significant interaction effect between the variables was found [$F(2,49)=8.77$, $p=.001$], and the effect size was large (partial eta squared = .26). The result can be seen in figure 1.

When interpreting the figure, it seems like the hypothesis of an interaction effect between low intelligibility and receptive-expressive LD was confirmed. The interaction effect was further investigated with additional analyses. An analysis of simple effects was conducted by splitting the children into groups according to intelligibility level, as with the two-way ANOVA above. Separate one-way ANOVAs were run to explore the effect of sub-diagnosis on externalising behaviours in each group. In the intelligible group, no statistical difference in mean scores of externalising behaviour was found between sub-diagnoses. In the unintelligible group however, there was a statistical difference at the $p \leq .05$ level in symptoms of externalising behaviours between sub-diagnoses [$F(2,12)=8.09$, $p=.006$]. Post-hoc comparison using the Tukey HSD test indicated that the mean scores of externalising behaviours for children with receptive-expressive LD diagnosis ($M=5.0$, $SD=2.58$) was statistically different from children with both suspected ($M=.33$, $SD=.58$) and expressive LD ($M=1.25$, $SD=1.49$). This indicates a significant interaction effect. None of the children in the low intelligibility group were controls.

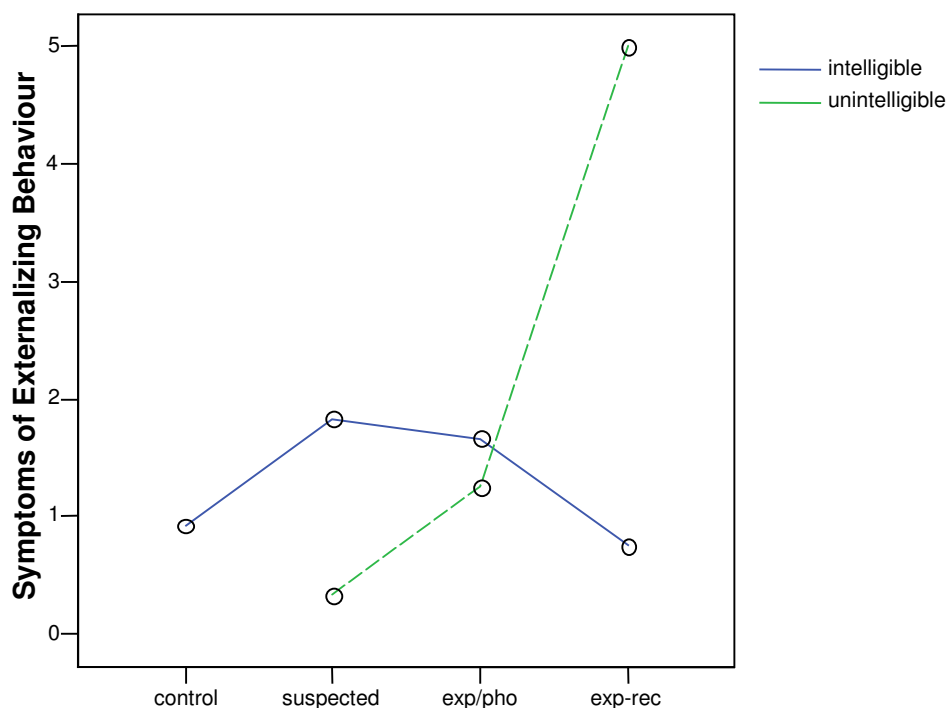


Figure 1. This figure shows an interaction between receptive-expressive LD and intelligibility in association with more symptoms of externalising behaviours.

An independent samples t-test was conducted to compare the mean scores of NVIQ for the intelligible and unintelligible groups, within the children with receptive-expressive language disorder. There was no significant difference in scores for high ($M=80.5$, $SD=6.2$) and low intelligibility [$M=89.0$, $SD=8.7$, $t(4,5)=-1.64$, $p=.15$]. This indicates that low IQ was not the reason for the difference found between groups.

Interaction in the Association between Language and Internalising Behaviour

The correlation coefficients of the relationship between the sum-score of socio-emotional behaviours and language measures were higher than the correlation coefficients of language measures and externalising and internalising behaviours separately. Since some of the children had symptoms on both scales of socio-emotional behaviours, and no one of the language measures seemed to be associated with internalising difficulties, it was hypothesised

that differences on the internalising scale would only be seen if the children also displayed symptoms of externalising behaviours.

A two-way between-groups analysis of variance was conducted to explore the impact of high or low intelligibility and less or more than three symptoms of externalising behaviour on symptoms of internalising behaviours. Participants were divided into groups according to symptoms of externalising behaviour. Children with 3 or more symptoms composed one group and children with two, one or no symptoms at all, the other group. There was a statistically significant interaction effect of externalising behaviours and intelligibility on

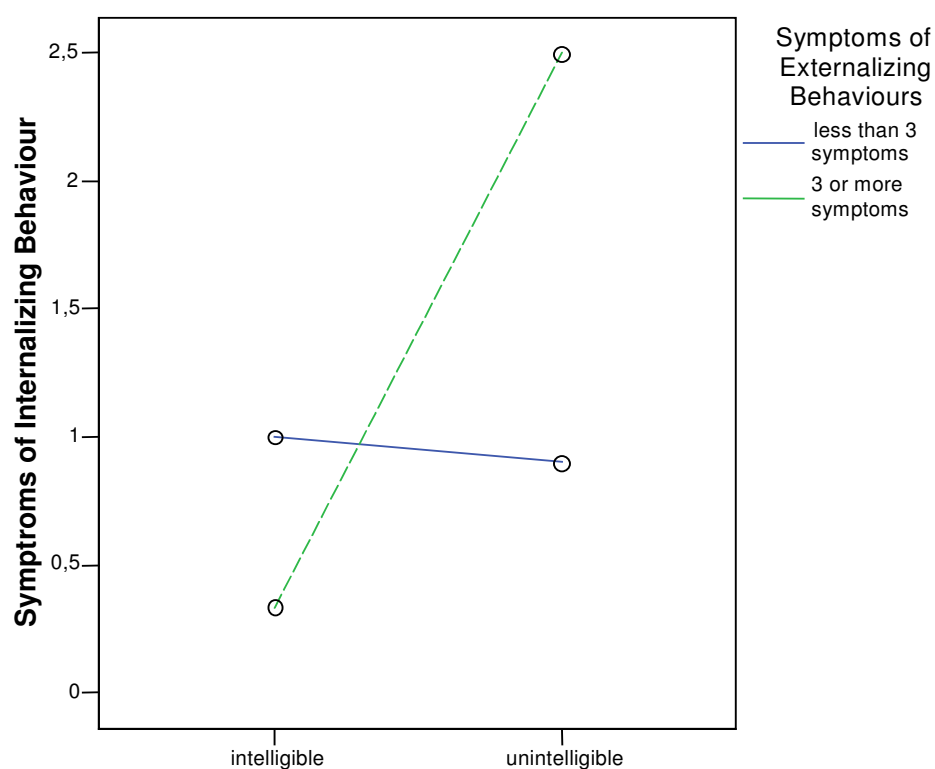


Figure 2. Interaction between unintelligible speech and symptoms of externalising behaviours on symptoms of internalising behaviours

internalising behaviour [$F(1, 55)=9.94, p=.003$]. The profile plots show that those children with low intelligibility and three or more externalising symptoms are more at risk of internalising behaviours than others (see Figure 2).

An independent samples t-test was conducted to compare the mean scores of NVIQ for the group with externalising problems and for the group with less than three symptoms, within the children with low intelligibility. There was no significant difference in scores for externalising ($M=93.8$, $SD=15.2$) and low intelligibility [$M=93.8$, $SD=8.6$, $t(6,9)=-.01$, $p=.99$]. This indicates that low IQ was not the reason for the difference found between the groups.

Combination of Symptoms of Internalising, Externalising and Language Disorders

As suggested by the previous analyses, some children display symptoms of both internalising and externalising symptoms. A one-way between-groups analysis of variance was conducted to explore the difference in intelligibility in relation groups of socio-emotional behaviour difficulties. The children was divided into groups according to type and combination of socio-emotional problems (Group; 0: less than three symptoms on both scales; Group 1: three or more symptoms of externalising behaviour, and less than three symptoms of internalising behaviour; Group 2: three or more symptoms of internalising behaviour, and less than three symptoms of externalising behaviour; Group 3: three or more symptoms on both scales). There was a statistically significant difference at the $p<.05$ level in intelligibility for the four groups [$F(3,55)=4.831$, $p=.005$]. Post hoc comparison using the Tukey HSD test indicated that the mean score for Group 0 ($M=13.87$, $SD=12.21$) was significantly different from Group 4 ($M=36.50$, $SD=4.20$). The effect size, calculated using eta squared, was .21. Neither Group 1 ($M=19.80$, $SD=9.34$) nor group 2 ($M=17.00$, $SD=10.74$) differed significantly from group 0 or 4.

The four children with three or more symptoms of both externalising and internalising symptom scales, were all boys, two was in the expressive and phonological group, and two was in the receptive-expressive group. Their mean score on intelligibility was 63,5, and their mean NVIQ was 94,3 which within the normal range. Although only four children had more than three symptoms on both scales, we saw that theses four were equally split up in sub-diagnoses, indicating that it is not necessarily a receptive-expressive language that best describe the relation between language and socio-emotional behaviours but rather, intelligibility.

Discussion

Findings in the present study suggest that unintelligible speech best describe the children with most symptoms of socio-emotional behavioural difficulties. The goal of this study was to examine whether three-year-old children with language disorders were more likely to have socio-emotional behavioural difficulties than normally developing children, and to explore how different subgroups of language disorders and measures of expressive language can contribute to an understanding of this association. In accordance with e.g. Baker and Cantwell (1982), Silva et al. (1987), a weak association between language disorders (LD) and socio-emotional behaviours was found. When further investigated, a stronger association was found between LD and externalising behaviour in children with unintelligible language together with a receptive-expressive language disorder. Internalising behaviour was only seen in association with LD if children also showed symptoms of externalising behaviours and had unintelligible language. Consequently symptoms on both behaviour scales were associated with low scores on intelligibility.

Differences between Control Children and LD Children in Socio-Emotional Behaviours

A relationship between LD and additional difficulties has been found in several research reports (Baker & Cantwell, 1982; Beitchman et al., 1996; McCabe, 2005). In the current study, however, it was found that being diagnosed with a language disorder was only weakly associated with socio-emotional behaviour difficulties. Compared to the control group, language-disordered children did not show significantly more symptoms of either externalising or internalising behaviours. There was a small difference between groups when the symptoms were added together.

Three explanations of the weak association between language disorder and socio-emotional behaviour found in this study are proposed.

Assessment at early age

The first possible explanation for the low association found between language disorders and socio-emotional behaviours in the current study is the children's age. The current study included children that were three years of age. This is a younger age than that of children in

studies where these associations are normally found (e.g. Beitchman et al, 1996). It is argued that severity and prevalence of language and behavioural problems, as well as the association between these, increase with age (Brownlie et al., 2004; Willinger et al., 2003). This makes it somewhat unlikely that differences between disordered and normally developing children are apparent at three years of age. A reason why most research has been done on older children is that young children do not have the same grammatical complexity as older children, and suitable language tests are hard to find. To measure grammatical complexity requires intelligible speech, and unintelligible utterances are often excluded from analyses when assessing children's language ability. Young children do not use long sentences, and children with language disorders even shorter. When excluding unintelligible utterances in these children's language, what is left is few and short sentences. This makes grammatical measures, such as MLU, an unprecise language measure when dealing with pre-school children with language disorders. Findings in the present study suggest that it was the unintelligible speech that best distinguish the children with most symptoms of socio-emotional behavioural difficulties at this age.

Language mechanisms identified as indicative of the association between language disorders and socio-emotional behaviour in pre-school, may however, differ from the mechanisms descriptive of this association when the child is older. Generalising results from late childhood to earlier developmental stages may fail to acknowledge the specificity of mechanisms present at different ages (Dionne et al., 2003). An argument is that LD in itself is not a risk factor, severity, type and persistence however is (Snowling, Bishop, Stothard, Chipchase, & Caplan, 2006).

Externalising problems are usually more prevalent in younger children, whereas internalising problems are more apparent in older children (McCabe, 2005). This is comparable to findings in the current study, where it was found correlations between measures of language and measures of externalising behaviour, but no significant correlation between language measures and internalising behaviour. A stronger association between language ability internalising behaviours might be expected, as the children grow older. Other research has found that behavioural problems occur at higher frequencies as age increases (Noterdaeme & Amorosa, 1999), indicating that the gap between children with disorders in language development and their normally developing peers tends to widen over time in areas such as socio-emotional behaviour. When doing research on young children it is therefore important to explore specific features of language, to identify the association with socio-

emotional behavioural symptoms. As seen in the present study, this association can be identified at three years of age if looking at children's level of intelligibility and type of sub-diagnosis of language disorder.

Population based study

The second possible explanation for why the current study found less than expected comorbidity between LD and socio-emotional behaviour, is that the sample is population-based rather than clinical. Differences in findings between studies are thought to vary according to the sample in focus. The main advantage with a population-based sample is that the included children display a wide variety of symptoms. Children attending clinics are usually more severely affected than children from the normal population, and studies based on clinical samples often fail to capture the children who are not that extreme (Plomin, 2002). Problems may be present in early childhood, but they are likely not yet to be severe enough for a diagnosis (Brownlie et al., 2004). Thus, population sampling might result in weaker associations between disorders, especially when children are young, and this might be one of the reasons why the association found between language disorder and socio-emotional behaviour was weak in the current study. In a community sample, the cut-off score for being selected to a language disorder category will vary.

In the current study, diagnosis was not made according to a predetermined cutoff, but was decided after careful assessment comprising two days of testing, interviewing and observations. In a clinic sample, children with mild symptoms of language disorders might not be represented at all. Especially when the children are young, and the variation in development is high, the threshold for referring a child for assessment is high. Because the current study has a population based sample, it included children with a variety of language disorders, and not only the extremes.

Population based samples are reflections of a general population, but is by some argued to inform only indirectly about language disorders. Conti-Ramsden and Botting (2004) argues that a generally language delayed group, as seen in a general population, are not the same as children in a clinically described population of language impaired children. It is argued that when doing research on preschool children, Conti-Ramsden and Botting's argument does not apply. When children are young it is difficult to identify the "true" language disordered children. Some children might have a temporarily delay, whereas others may develop more severe language disorders. When studying young children it in population

based samples it is however important that samples are properly specified. In the current study it was found that a generally delayed group of language disordered children is not sufficiently specified to inform about the variation of co-occurring problems. Because a broad group of LD children were included in the current study, the LD group was not different from the control group in externalising and internalising symptoms. When the sample of language disordered children were more precisely described, a stronger association was seen.

General and specific language disorders

The third plausible explanation for why there were weak associations between the LD and socio-emotional behaviours in children in the current study, compared to other studies, is the issue of previous literature's use of non-specific criteria for language disorders. Findings from the current study imply that the weak association between LD and socio-emotional behaviours were strengthened when investigating different features of language in disordered children using video analyses to transcribe the children's language in addition to traditional diagnoses. Children participating in the ABC-study were selected on the basis of wide inclusion criteria. However, an in-depth assessment of the children made it possible to identify children with language disorders, and at the same time exclude children with limited language abilities due to autism spectrum disorders or mental retardation.

A general problem in research on language has been that children with mental retardation and autism have not been excluded from the language samples. This is especially seen in population studies where children are screened in as language-disordered when scoring low on a particular language test, but without control for other disorders such as autism and mental retardation. When research has been done on young children and with parent-reports, the difference between children with autism and children with a pure language disorder is small and often difficult to detect. They may be an overlap between different developmental disorders, but the differences can be detected if careful assessment is done. Language disorders can be identified and diagnosed while children are 3 years of age, as has been done in the current study. This sample of children with language disorders gives the possibility to acquire knowledge of the association between language disorders and socio-emotional behaviour problems at three years of age. Since the current study was part of a longitudinal study, it will be possible to follow the developmental trajectories of these children. Future analyses will indicate whether the differentiation made in the ABC-clinic, between children suspected for autism and LD children was valid at 3 years of age.

Differentiation of Language Symptoms in Association to Socio-Emotional Behaviour

Once autistic and mentally retarded children were excluded, a more precisely described group of language disordered children remained. It was hypothesized however, that further differentiation of LD would better reveal the association with socio-emotional behaviour problems. According to the dominant opinions in the literature, one hypothesis of the current study was that children with a mixed receptive-expressive LI were more at risk compared to children with pure expressive disorders. No significant difference between diagnoses was found. The mean amount of behaviour problems was higher in children with receptive-expressive difficulties, but the difference did not reach significance in the current sample. A reason for this could be that the sample is small, and the variation in reported symptoms is low at this age. A more likely reason, regarding the current findings is that what differentiates these children best, concerning risk for socio-emotional behaviour is not type of diagnosis alone, but the interaction with level of intelligibility.

Because the current study, in addition to diagnosing sub-disorders, measured language on two continuous measures, provides an understanding of the association between language disorder and externalising behaviour in pre-school children, that is not reported in earlier research. Both MLU and INT were shown to be significantly associated with language disorder, but only INT was associated with socio-emotional behaviour difficulties. This is an important finding. It indicates that both are good language measures, but that only one of them is associated with additional difficulties.

MLU is a measure that has been thoroughly discussed in previous literature. Some authors (Rice, Redmond, & Hoffman, 2006) strongly support the use of MLU as a measure of expressive language abilities, whereas a review by Eisenberg, Fersko, and Lundgren (2001), argued that MLU should not be used as a measure of syntactic development, but merely as a way of measuring utterance length. They argue that MLU will identify some, but not all, language delayed preschool children. Further, they suggest that low MLU may be used as an indicator of language disorder, but should never be used alone for the purpose of diagnosis.

The benefits of using multiple assessment forms in assessing language ability (DeThorne, Johnson & Loeb, 2005) is demonstrated in the current study. The findings concerning language measures were reasonably straightforward. In answering the hypotheses it was found that that INT was the only measure that was significantly associated with socio-

emotional behaviours, although only with externalising behaviours. MLU significantly differentiates the children with language disorders from the non-disordered, but it did not correlate significantly with socio-emotional behavioural problems. INT differentiated between LD and control children, and also revealed an association with socio-emotional behavioural problems. In answering the research question, of which language measures best described the relation between LD and socio-emotional behaviours, it was found that that INT was the only measure that was significantly associated with socio-emotional behaviours, although only with externalising behaviours.

When exploring the interaction between diagnosis and the different language measures, results showed that children with language disorders, with a low percentage of intelligible speech in addition to a mixed expressive/receptive language diagnosis, were more likely to display externalising symptoms than were others. Estimates of effect size for significant differences in externalizing behaviours, between children with high and low intelligibility, within the receptive-expressive diagnosis group, were “high” (Cohen, 1988). Although intelligibility alone was associated with externalising behaviours, no association was seen in externalising behaviours between different language disorders. If however intelligibility was seen together with a receptive-expressive diagnosis the difference of externalising behaviours from the other groups were strong. On the other hand the children with additional difficulties in internalising behaviours, was not necessarily associated with an expressive-receptive language disorder. In these children intelligibility was the overall best measure to reveal an association with socio-emotional behaviour symptoms.

In a study by Irwin et al. (2002), two-year-old children with expressive language difficulties were found to have more internalising difficulties than non-disordered peers. The difference was moderate. There was, however no difference in externalising behaviours. This is not in accordance to findings in the present study. A reason for the different findings could be that children in Irwin et al.’s study were exclusively delayed in expressive language. Children with receptive difficulties were excluded. In the current study externalising difficulties were associated with receptive-expressive LD, and not with expressive language alone. It can be argued that Irwin et al.’s findings support the findings in the present study, by suggesting that expressive LD is not highly related to externalising difficulties. As in the current study children with internalising difficulties were found in the LD group with expressive language disorders, and not necessarily associated with receptive-expressive LD. We do not know however, whether children with symptoms of internalising behaviours in

Irwin et al.'s study also displayed symptoms of externalising behaviours, as was seen in the present study.

Children at this age might actually have fewer symptoms of internalising problems than older children do. The occurrence of internalising symptoms might also be present, but undetected by parents. Because of the overt features of externalising behaviours compared to covert internalising behaviours these symptoms are more likely to be noticed by parents. When parents become aware of externalising problems, a generally raise in attention towards the child's behaviour could contribute to discovery of symptoms of internalising behaviours as well.

As seen in the current study internalising and externalising behaviours appeared to coexist in some children. Children with symptoms of both internalising and externalising behaviours also scored in the lowest percents of intelligible utterances. This was interpreted as an expression of severity. Children with symptoms of both behaviour scales in addition to a language disorder are likely to be more at risk of future psychiatric and developmental difficulties than are less severely affected children. According to Ladd and Burgess (1999), children with a combination of externalising and internalising behaviour fail to establish social networks, because of rejection by peers. This contributes to lack of satisfactory language learning environment, and language development may be influenced. Different trajectories are usually associated with language disorders, externalising, and internalising behaviours. A trajectory of externalising behaviour is thought to be persistent from preschool throughout school years, as is internalising behaviour (Mesman et al., 2001). It is difficult to propose the trajectories of children with a disorder in language as well as symptoms of both internalising and externalising behaviours at the age of three. More research in this area is needed to understand what the long term consequences of several difficulties can mean for development. However, it was reasonable to assume that difficulties in both being understood by others and understanding others together form a risk marker for externalising behaviours, as do the combination of not being understood and displaying externalising behaviours was a risk marker for internalising behaviours.

Alternative Interpretations

About 50% of the invited families agreed to come to clinical assessments in the ABC-study. It is not known what patterns exist in the other half of the population, and this makes it difficult to generalise the current results. This is a problem that most population-based research has to

deal with. In many instances it means that the families participating in a large clinical study like the ABC-study are a selective group. Families participating in this type of research might see an opportunity to get a thorough assessment of their child. If they have a concern for their child, but are uncertain of the severity of the problem and therefore do not seek professional help, an assessment in a research project could present a safe solution. If this hypothesis were supported, there would be an overrepresentation of problems in the control group. The control group used in the present study includes two children with psychiatric diagnoses, and three with suspected diagnoses.

There are no systematical differences in LD and control group in neither SES nor income. Because the primary goal of this study was to compare language impaired children to normally developing children, and with a sample that is similar on SES, it is assumed that this is not what influences the differences between the groups.

Since children in the current study were originally screened in as a result of assessment for suspected autism spectrum disorders (ASD), it is obvious to ask whether the language difficulties found in the current LD sample was the same language difficulties that occur in ASD children. It is not likely that what was treated as language disorders in the present study was early signs of autism. The included children went through thorough assessments by clinical specialists, with a specific focus on discovering symptoms of autism, and children where such symptoms were found were excluded from the current LD group.

Another question is whether the association between LD and socio-emotional behavioural difficulties could be due to IQ. In the current study children were compared on non-verbal IQ scores, and there was found to be a significant difference between LD and control children, but all children were within the normal range on non-verbal IQ scores. Non-verbal IQ was shown to be significantly correlated with internalising difficulties, but not with externalising difficulties. On discovery of a significant interaction effects, the possibility that differences could be due to non-verbal IQ was investigated, but was found not to be the case. and the results showed that it could not. It is therefore reasonable to believe that the associations found in the present study are not due to intelligence.

Limitations

The main limitation in the present study was the low n and consequently low statistical power. This is however a limitation that most similar research experiences. When operating with low n , and with variables where the population distribution is skewed, as is the case with all

measures of abnormality, data are vulnerable to violations of assumptions of statistical normality. However, both parametric and non-parametric statistical tests were applied where possible, and no major differences were detected. Results should however, be treated with care.

One strength of the current design, however, is the inclusion of a comparison group, although unfortunately, this control group was not matched on gender. The case group comprised 80% boys, whereas in the control group, gender was equally distributed. This made it difficult to compare girls with boys on different variables. Further investigation is therefore needed to find out whether the same findings regarding socio-emotional behaviours can be found for both boys and girls.

An important implication of the current study is with regard to measurement in a comorbidity design. To ensure valid assessment of one variable requires careful consideration of the possible influence of the other (Redmond & Rice, 1998). Measuring socio-emotional behaviours with parent-reported symptoms from the PAPA interview, questions were raised to whether what was reported could be influenced by the child's language ability. This possibility was carefully considered when the scales of internalising and externalising behaviours were put together for use in the current study. All items thought to have a connection to verbal ability, such as arguing and lying, were excluded from the scales of behavioural symptoms. When measuring language, it is important to consider whether intelligibility is actually a measure of language, or just an indication of severity. Since it correlated highly with MLU, and differentiates the LD group from the control group, intelligibility was thought to measure language independent of severity.

Whereas several sources were used to measure language, only one source – parent report - was used to gather information on the children's socio-emotional behaviours in the current study. However, parental reports were obtained during a clinical interview situation, in which any misunderstandings could be addressed. As reported by Hinshaw et al. (1993), compared to teachers, parents are thought to underreport symptoms in their children. Thus, it is reasonable to believe that the children in the current study actually displayed these symptoms, and that the associations found was not due to overreporting of symptoms, from the informant.

Causal and Directional Interpretations

There is little available literature on theory concerning the association between language and behaviour. This contributes to a more difficult interpretation of the current findings. Rarely any researcher state a theoretical position, with predecided outcomes (Redmond & Rice, 1998). There are several theories concerning development of language and behaviour separately, but very few tries to link these developmental trajectories together. A broad overview of assumptions concerning cause and direction between language and socio-emotional behaviours will be presented.

A third factor might underlie both language and socio-emotional difficulties. This could be a general neurodevelopmental dysfunction, or a genetic predisposition. Supporting a genetic correlate, Cohen and colleagues (1996) found that siblings of children referred for language disorders are at greater risk of language disorders than children with non-impaired siblings are. They also found that boys were over-represented, which is yet another indication that genes might be involved in explaining the association. That boys demonstrated a heightened level of both LD and socio-emotional problems is a finding supported by several researchers (Plomin et al., 2002; Lindsay & Dockrell, 2000).

A third factor could be a dysfunction that either serves as a trigger for a general delay in several areas of functioning, or it could be a direct cause of two separate, but co-occurring disorders. Designs such as that employed in the current study, where different aspects of a certain disorder are explored, support the view that disorders are specific, due to an ability to differentiate between the different aspects. If a general delay were the reason for the association found in the current study, a differentiation between specific areas of language functioning within the group of language-disordered children would not have been detected.

Socio-emotional problems could be a result of inability to express or comprehend appropriately the meanings of people and environment. Lack of understanding makes a child frustrated and this in turn leads to symptoms like aggression and inhibition. If a child is not able to understand other person's communication, or to communicate their own thoughts and feelings in words, other means of communication are used. Integration in society is done by assessing, and adapting to, social interaction. Children with communication difficulties will not have the means of integrating, and will not learn and understand which behaviours are suitable in different situations (Willinger, 2003).

Children with co-occurring symptoms of language disorders and socio-emotional behavioural problems might be socially adverse. This can lead to lack of good language

learning environment for these children, which again leads to less language development. Children who display disruptive behaviour will complicate their own learning environment. These children get into a negative social spiral where language disabilities contribute to lack of social interaction, which leads the child to ignorance of how to behave with others, which can lead to disruptive behaviours, which again leads to lack of social interaction. This interpretation does not say anything about direction. It simply states that the two disorders influence each other negatively. This is not contradictory to having a neurodevelopmental or genetic predisposition for the disorders.

Conclusion

In answering the research questions results from the current study confirmed that it was an association between language disorders and socio-emotional behaviour problems in three-year-old children. The main findings from the current study were that the intelligibility of children's expressive language was the overall best language measure to describe an association with socio-emotional behaviour problems.

Language disorders are often unsuspected in children as young as 3 ½ years old. A reason for this could be that there is no good way of measuring language during the pre-school years. Children at this age lack the linguistic capacity necessary for comparing and measuring spoken language. Findings from the current study suggest that it is possible to measure the lack of such capacities by looking at children's unintelligible speech.

When language disorders are found at this age, it is thought to be associated with increase the risk of future and concurrent developmental difficulties. However, for most children the language problems will resolve, and development will proceed as normal. To understand which language characteristics that constitute risk markers for future problems would also reveal which characteristics that were insufficient for such an association. Such an understanding would have implications for treatment and intervention. Intervention programmes has rarely been focused on comorbidity. The most severely affected children in the current study were associated with a combination of several different symptoms, both in language and behaviour. When one aspect of behaviour may cause more concern than the other, comorbidity remains undetected. This may lead to interventions directed towards behaviour, when language might be the area where the child would benefit the most from receiving help.

On basis of the current study it is suggested that sub-dividing language disorder children into different diagnoses is not sufficient to describe the association between language disorders and socio-emotional behavioural difficulties at three-years of age. It appears that this association can be more precisely described by additional evaluations of the intelligibility of children's expressive language.

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